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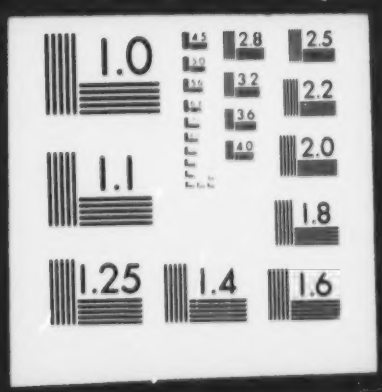

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IMPLEMENTATION PLAN REVIEW FOR KANSAS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT

TRW/Environmental Services

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December 1974

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16. ABSTRACT

Section IV of the Energy Supply and Environmental Coordination Act of 1974, (ESECA) requires EPA to review each State Implementation Plan (SIP) to determine if revisions can be made to control regulations for stationary fuel combustion sources without interferring with the attainment and maintenance of the national ambient air quality standards. This document, which is also required by Section IV of ESECA, is EPA's report to the State indicating where regulations might be revised.

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IMPLEMENTATION PLAN REVIEW
FOR
KANSAS
REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT

PREPARED BY THE FOLLOWING TASK FORCE:

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(Contract 68-02-1358)

U. S. Environmental Protection Agency
Office of Air and Waste Management
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

December 1974

TABLE OF CONTENTS

		Page
1.0	EXECUTIVE SUMMARY	1
2.0	STATE IMPLEMENTATION PLAN REVIEW	5
	2.1 Air Quality Setting - Kansas	8
	2.2 Kansas Particulate Emissions	9
	2.3 Kansas SO_2 Emissions	9
	2.4 Background on Kansas SIP	10
3.0	AQCR ASSESSMENTS BASED ON SIP REVIEW AND CURRENT AIR QUALITY	12
	3.1 AQCR 094 - Metro Kansas City Interstate	12
	3.2 Eastern Kansas AQCR's 095 (North East) and 098 (South East)	14
	3.3 AQCR 099 (South Central)	16
	3.4 Western AQCR's 096, 097, and 100	17
	3.5 Special Consideration - Fossil Fuels (Table F-3)	17
	APPENDIX A - Background Information on SIP, Air Quality, Emissions	18
	APPENDIX B - Candidacy Assessments for Relaxation of Regulations/Fuel Switch Potential	32
	APPENDIX C - Power Plant Assessments	35
	APPENDIX D - Industrial Commercial Sources Assessment	53
	APPENDIX E - Area Source Assessment	62
	APPENDIX F - Regulation Evaluation and Fuel Statistics	64

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1.0 EXECUTIVE SUMMARY

The enclosed report is the U. S. Environmental Protection Agency's (EPA) response to Section IV of the Energy Supply and Environmental Coordination Act of 1974 (ESECA). Section IV requires EPA to review each State Implementation Plan (SIP) to determine if revisions can be made to control regulations for stationary fuel combustion sources without interfering with the attainment and maintenance of the National Ambient Air Quality Standards (NAAQS). In addition to requiring that EPA report to the State on whether control regulations might be revised, ESECA provides that EPA must approve or disapprove any revised regulations relating to fuel burning stationary sources within three months after they are submitted to EPA by the States. The States may, as in the Clean Air Act of 1970, initiate State Implementation Plan revisions; ESECA does not, however, require States to change any existing plan.

Congress has intended that this report provide the State with information on excessively restrictive control regulations. The intent of ESECA is that SIP's, wherever possible, be revised in the interest of conserving low sulfur fuels or converting sources which burn oil or natural gas to coal. EPA's objective in carrying out the SIP reviews, therefore, has been to try to establish if emissions from combustion sources may be increased. Where an indication can be found that emissions from certain fuel burning sources can be increased and still attain and maintain NAAQS, it may be plausible that fuel resource allocations can be altered for "clean fuel savings" in a manner consistent with both environmental and national energy needs.

In many respects, the ESECA SIP reviews parallel EPA's policy on clean fuels. The Clean Fuels Policy has consisted of reviewing implementation plans with regards to saving low sulfur fuels and, where the primary sulfur dioxide air quality standards were not exceeded, to encourage States to either defer compliance regulations or to revise the SO_2 emission regulations. The States have also been asked to discourage large scale shifts from coal to oil in cases where such shifts are not required for the attainment and maintenance of the NAAQS.

To date, EPA's fuels policy has addressed only those States with the largest clean fuels saving potential. Several of these States have or are currently in the process of revising SO_2 regulations. These States are generally in the Eastern half of the United States. ESECA, however, extends the analysis of potentially over-restrictive regulations to all 55 States and territories. In addition, the current reviews address the attainment and maintenance of all the National Ambient Air Quality Standards.

There are, in general, three predominant reasons for the existence of overly restrictive emission limitations within the State Implementation Plans. These are 1) The use of the example region approach in developing State-wide air quality control strategies; 2) the existence of State Air Quality Standards which are more stringent than NAAQS; and 3) the "hot spots" in only part of an Air Quality Control Region (AQCR) which have been used as the basis for controlling the entire region. Since each of these situations affect many State plans and in some instances conflict with current national energy concerns, a review of the State Implementation Plans is a logical follow-up to EPA's initial appraisal of the SIP's conducted in 1972. At that time SIP's were approved by EPA if they demonstrated the attainment of NAAQS or more stringent state air quality standards. Also, at that time an acceptable method for formulating control strategies was the use of an example region for demonstrating the attainment of the standards.

The example region concept permitted a State to identify the most polluted air quality control region (AQCR) and adopt control regulations which would be adequate to attain the NAAQS in that region. In using an example region, it was assumed that NAAQS would be attained in the other AQCR's of the State if the control regulations were applied to similar sources. The problem with the use of an example region is that it can result in excessive controls, especially in the utilization of clean fuels, for areas of the State where sources would not otherwise contribute to NAAQS violations. For instance, a control strategy based on a particular region or source can result in a regulation requiring 1 percent sulfur oil to be burned state-wide where the use of 3 percent sulfur coal would be adequate to attain NAAQS in some locations.

EPA anticipates that a number of States will use the review findings to assist them in making the decision whether or not to revise portions of their State Implementation Plans. However, it is most important for those States which desire to submit a revised plan to recognize the review's limitations. The findings of this report are by no means conclusive and are neither intended nor adequate to be the sole basis for SIP revisions; they do, however, represent EPA's best judgment and effort in complying with the ESECA requirements. The time and resources which EPA has had to prepare the reports has not permitted the consideration of growth, economics, and control strategy tradeoffs. Also, there has been only limited dispersion modeling data available by which to address individual point source emissions. Where the modeling data for specific sources were found, however, they were used in the analysis.

The data upon which the reports' findings are based is the most currently available to the Federal Government.* However, EPA believes that the States possess the best information for developing revised plans. The States have the most up-to-date air quality and emissions data, a better feel for growth, and the fullest understanding for the complex problems facing them in the attainment and maintenance of air quality standards. Therefore, those States desiring to revise a plan are encouraged to verify and, in many instances, expand the modeling and monitoring data supporting EPA's findings. In developing a suitable plan, it is suggested that States select control strategies which place emissions for fuel combustion sources into perspective with all sources of emissions such as smelters or other industrial processes. States are encouraged to consider the overall impact which the potential relaxation of overly restrictive emissions regulations for combustion sources might have on their future control programs. This may include air quality maintenance, prevention of significant deterioration, increased TSP, NO_x, and HC emissions which occur in fuel switching, and other potential air pollution problems such as sulfates .

Although the enclosed analysis has attempted to address the attainment of all the NAAQS, most of the review has focused on total suspended particulate matter (TSP) and sulfur dioxide (SO_2) emissions. This is because stationary fuel combustion sources constitute the greatest source of SO_2 emissions and are a major source of TSP emissions.

* Other than data currently being processed by EPA

Part of each State's review was organized to provide an analysis of the SO_2 and TSP emission tolerances within each of the various AQCR's. The regional emission tolerance estimate is, in many cases, EPA's only measure of the "over-cleaning" accomplished by a SIP. The tolerance assessments have been combined in Appendix B with other regional air quality "indicators" in an attempt to provide an evaluation of a region's candidacy for changing emission limitation regulations. In conjunction with the regional analysis, a summary of the State's fuel combustion sources (power plants, industrial sources, and area sources) has been carried out in Appendix C, D, and E.

FINDINGS

- The Kansas State Implementation Plan has been reviewed for the most frequent causes of over-restrictive emission limiting regulations. The particulate and sulfur dioxide regulations which now apply in Kansas do not appear overly restrictive in the context of Section IV of ESECA.

- The State of Kansas used Metro Kansas City as the example region to demonstrate attainment of particulate NAAQS, using an air quality display model rather than linear rollback. Kansas has not adopted air quality standards more strict than the federal standards and has not designated any AQMA's to date. Current monitoring data shows TSP to be a widespread problem throughout Kansas, although fuel combustion is a minor contributor in many areas. Current fuel use practices result in most sources emitting well below particulate regulations at present, especially in Central and Western Kansas. Clean fuel savings is thus possible under existing regulations, with NAAQS being the limiting factor. Thus, Kansas fuel burning particulate regulations should not be relaxed.

- SO_2 levels in Kansas were well below NAAQS when the Kansas SIP was written. The plan demonstrated that source growth would not cause NAAQS to be violated in Kansas City and thus no SO_2 regulation was established. Kansas has since adopted a state-wide SO_2 regulation on large fuel burning sources. All sources are in apparent compliance with this regulation, particularly in Central and Western Kansas where natural gas is the predominant fuel. Current SO_2 monitoring indicates very low SO_2 levels in outstate Kansas, with somewhat higher levels in Wichita and Kansas City. There is an indication that, at least in Kansas City (AQCR 094), NAAQS for SO_2 may be violated if all fuel sources were to emit exactly at the Kansas SO_2 regulation. In Kansas' other AQCR's, NAAQS might not be violated if fuel switching were to occur. Since some such fuel switching can occur without regulation change, revision of the Kansas SO_2 emission regulation is not recommended.

2.0 STATE IMPLEMENTATION PLAN REVIEW

SUMMARY

A revision of fuel combustion source emissions regulations will depend on many factors. For example:

- Does the State have air quality standards which are more stringent than NAAQS?
- Does the State have emission limitation regulations for control of (1) power plants, (2) industrial sources, (3) area sources?
- Did the State use an example region approach for demonstrating the attainment of NAAQS or more stringent State standards?
- Has the State not initiated action to modify combustion source emission regulations for fuel savings; i.e., under the Clean Fuels Policy?
- Are there no proposed Air Quality Maintenance Areas?
- Are there indications of a sufficient number of monitoring sites within a region?
- Is there an expected 1975 attainment date for NAAQS?
- Based on (1973) air quality data, are there no reported violations of NAAQS?
- Based on (1973) air quality data, are there indications of a tolerance for increasing emissions?
- Are the total emissions from stationary fuel combustion sources proportionally lower than those of other sources?
- Must emission regulations be revised to accomplish significant fuel switching?
- Is there a significant clean fuels savings potential in the region?
- Do modeling results for specific fuel combustion sources show a potential for a regulation revision?

The following portion of this report is directed at answering these questions. An AQCR's potential for revising regulations increases when there are affirmative responses to the above.

The initial part of the SIP review report, Section 2 and Appendix A, was organized to provide the background and current situation information for the State Implementation Plan. Section 3 and the remaining Appendices provide an AQCR analysis which helps establish the overall potential for revising regulations. Emission tolerance estimates have been combined in Appendix B with other regional air quality "indicators" in an attempt to provide an evaluation of a region's candidacy for revising emission limiting regulations. In conjunction with the regional analysis, a characterization of the State's fuel combustion sources (power plants, industrial sources, and area sources) has been carried out in Appendix C, D, E. Finally, candidates from Appendix B are examined in Appendix F for adequacy or overrestrictiveness of emission regulations.

Based on an overall evaluation of EPA's current information, AQCR's have been classified as good, marginal, or poor candidates for regulation revisions. The following table summarizes the State Implementation Plan Review. The remaining portion of the report support this summary with explanations.

KANSAS STATE IMPLEMENTATION PLAN REVIEW

"INDICATORS"	STATE		(Metro Kansas City) (SUMMARY) 094 AQCR		(N. East) 095 AQCR		(N. Central) 096 AQCR		(N. West) 097 AQCR		(S. East) 098 AQCR		(S. Central) 099 AQCR		(S. West) 100 AQCR	
	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2	TSP	SO_2
• Does the State have air quality standards which are more stringent than NAAQS?	No	No														
• Does the State have emission limiting regulations for control of:																
1. Power plants	Yes	Yes														
2. Industrial sources	Yes	Yes														
3. Area sources	Yes	No														
• Did the State use an example region approach for demonstrating the attainment of NAAQS or more stringent State standards?	Yes	yes														
• Has the State initiated action to modify combustion source emission regulations for fuel savings; i.e., under the Clean Fuels Policy?	No	No														
• Are there proposed Air Quality Maintenance Areas?	no	no.														
• Are there indications of a sufficient number of monitoring sites within a region? (1)	Yes	Yes														
• Is there an expected 1975 attainment date for NAAQS?			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
• Based on reported (1973) Air Quality Data, does air quality meet NAAQS?			No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
• Based on reported (1973) Air Quality Data, are there indications of a tolerance for increasing emissions?			No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
• Are the total emissions from stationary fuel combustion sources lower than those of other sources?			Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
• Do modeling results for specific fuel combustion sources show a potential for a regulation revision?			No modeling results available for Kansas sources													
• Must emission regulations be revised to accomplish significant fuel switching?			No	No	No	No	No	No	No	No	No	No	No	No	No	No
• Based on the above indicators, what is the potential for revising fuel combustion source emission limiting regulations?			Poor	Poor	Poor	Marginal	Poor	Marginal	Poor	Marginal	Poor	Marginal	Poor	Marginal	Poor	Marginal
• Is there a significant Clean Fuels Saving potential in the region?			No	Yes(2)	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

(1) An analysis tool only and does not reflect SIP requirements.

(2) Additional SO_2 emissions can occur in all Kansas AQCR's without violating either NAAQS or existing regulations. Thus some clean fuels could in principle be saved in Kansas via fuel switching within the existing legal framework.

2.1 AIR QUALITY SETTING - KANSAS

Kansas has been divided into seven (7) Air Quality Control Regions:

1. AQCR 094 - Metro Kansas City Interstate
2. AQCR 095 - North East Kansas
3. AQCR 096 - North Central Kansas
4. AQCR 097 - North West Kansas
5. AQCR 098 - South East Kansas
6. AQCR 099 - South Central Kansas
7. AQCR 100 - South West Kansas

These AQCR's are shown in Figure A-1. Ambient air quality standards for SO_2 and TSP in Kansas are identical to federal standards and are shown in Table A-3.

2.1.1 Suspended Particulates

Table A-4 summarizes Kansas TSP data from the SAROAD Data Bank for 1973. TSP appears adequately monitored in Kansas with Metro Kansas City (AQCR 094) and South Central Kansas (AQCR 099) having the greatest number of monitors. All AQCR's in Kansas experience some type of TSP problems, with Metro Kansas City (094) and South Central (Wichita - AQCR 099) showing the highest annual geometric means. AQCR's 096 (North Central), 097 (North West), 098 (South East), and 100 (South West) show annual means below the primary particulate standard. These same four AQCR's appear to have localized particulate problems rather than regionwide problems. All AQCR's in Kansas show violations of the 24 hour secondary standard and only AQCR 100 (South West) has no violations of the primary 24 hour standard. As elsewhere in the western half of the United States, fugitive dust probably contributes to short term particulate problems.

Table A-4 is intended to show both the intensity and breadth of TSP problems in Kansas. Included are calculations of the percentage of stations exceeding the standards as well as the percentage reduction required to meet both the annual and short term standards at the worst station in each AQCR.

2.1.2 Sulfur Dioxide

Table A-5 summarizes SO_2 monitoring data of Kansas AQCR's. The number of monitors in each AQCR appears adequate relative to emission and population densities. AQCR's 096, 097, 098, and 100 have levels of 10% to 25% of the federal standards (both annual and 24 hour). South Central (099) and North East (095) have concentrations about 65% and 30% of the SO_2 standards respectively. Metro Kansas City indicates SO_2 levels of around 80% of the 24 hour standard on the Kansas side, although the highest annual average in Kansas City is only 35% of the annual standard.

The range of SO_2 concentrations seen in Kansas suggests relatively high levels in localized spots. Also, concentrations are more likely to approach the short term standard than the annual average standard.

2.2 KANSAS PARTICULATE EMISSIONS

Table A-8 lists particulate emissions in the 1972 NEDS Data Bank for Kansas. All AQCR's show a minority of particulate emissions resulting from fuel combustion. Even Metro Kansas City Interstate has only 15% of its total particulate emissions from fuel combustion (Kansas side). Further, only in North East (AQCR 095) and South East (098) does a large fraction of the fuel emissions result from electric power generation. Area source fuel combustion generally dominates the fuel combustion fraction of particulate inventories in the largely rural Kansas AQCR's (094, 096, 097, 099, and 100).

2.3 KANSAS SO_2 EMISSIONS

Table A-7 summarizes 1972 NEDS data for SO_2 emissions. About 70% of SO_2 emissions result from fuel combustion in the Kansas side of AQCR 094 (Metro Kansas City), although the largest fraction of total SO_2 in 094 originates in Missouri. In AQCR 095 (North East Kansas) about 90% of SO_2 emissions result from fuel combustion, primarily from electric power generation. AQCR's 096 to 100 show SO_2 emissions resulting from fuel combustion to be less than half of the total, and only AQCR 098 (South East) has significant electric power contributions. As was the case with particulates, area fuel use is the major contributor of SO_2 to the fuel portion of the inventory in all Kansas AQCR's.

2.4 BACKGROUND ON KANSAS SIP

Kansas air quality data for 1969 and 1970 was used for SIP preparation. Table A-9 lists the maximum particulate level reported in the SIP for each AQCR. Notice that only AQCR 098 (South East) did not exceed the annual secondary particulate standard at that time. SO_2 levels (1970 and 1971) found in the Kansas SIP are shown in Table A-10 (only AQCR's 094, 095, and 099 had monitoring data). SC_2 levels even in Metro Kansas City were well below ambient SO_2 standards. Oxidant levels (about 200 $\mu g/m^3$, 1 hour average) in AQCR 094 and 099 were above the ambient air quality standards (160 g/m^3, 1 hour average) during 1971. NO_2 levels were below the federal standard in 1970 and 1971 in Kansas. Based on the above levels the priorities for AQCR's listed in Table A-1 were assigned.

2.4.1 Particulates

The Kansas SIP used AQCR 094 (Metro Kansas City) as the example region for particulates. Emission estimates from both point and area sources, and expected reductions under plan implementation were developed for AQCR 094. Rather than rollback of total emissions proportional to air quality, the Kansas City region was shown to meet ambient air standards using a diffusion model. It was expected that implementation of the example region particulate control regulations elsewhere in the state would be adequate to attain air quality standards. Existing particulate fuel burning regulations are shown in Table A-11.

2.4.2 Sulfur Dioxide

Although Kansas SO_2 levels were (and still are) below standards, the Kansas State Board of Health adopted SO_2 regulations. Fuel burning sources are limited to 3 lbs $SO_2/10^6$ Btu heat input. This regulation applies to all sources that would increase their SO_2 emissions by a factor of 2 or more from their base year (1971). Most new SO_2 emission sources were assumed to be controlled by Federal New Source Performance Standards (Table A-11). Estimated total SO_2 emissions in 1970 (from the SIP) are shown in Table A-10 for AQCR 094.

2.4.3 Oxidant

The Kansas SIP calculated a 31% hydrocarbon emission reduction in South Central (099) and a 24% reduction in Metro Kansas City (094) by 1975 as a result of the federal motor vehicle control program. These reductions were deemed sufficient to attain ambient air quality standards. No additional hydrocarbon controls were seen necessary, although some regulations on petroleum storage, etc. were imposed. The total hydrocarbon emission inventories in 1970 from the SIP were: 094 (Kansas City) - 180×10^3 tons, 099 (South Central) - 72×10^3 tons.

2.4.4 NO_x

Although NO_2 levels were below ambient air quality standards in 1970 in Kansas, NO_x regulations have been imposed on fuel burning sources (Table A-11) in Kansas.

3.0 AQCR ASSESSMENTS BASED ON SIP REVIEW AND CURRENT AIR QUALITY

The purpose of this section is to examine fuel switching in each of Kansas' seven AQCR's and the adequacy or over-restrictiveness of current regulations for attaining and/or maintaining ambient air quality standards. Tables A-9 and A-10 are an attempt to assign a regional emissions tolerance for Kansas AQCR's. Appendix B uses this "tolerance," along with such factors as the breadth and depth of air quality violations and percent of emissions resulting from fuel combustion to rate each AQCR as a "good," "marginal," or "bad" candidate for fuel switching potential and regulation relaxation.

Power plants, industrial sources, and area sources are investigated in Appendices C, D, and E respectively for fuel use, emissions, and current regulations. Some calculations of emissions resulting from fuel switching are included for power plants. Appendix F is a rough emissions inventory which could hypothetically result if all fuel burning sources emitted exactly at regulation levels. This inventory is the final test of current regulations relative to air quality.

Although each AQCR is treated separately in the appendices, some AQCR's are lumped together in this section because their situation is similar and thus final conclusions concerning regulations are similar.

3.1 AQCR 094 - METRO KANSAS CITY INTERSTATE

3.1.1 Candidacy Assessment for Fuel Switch Potential

AQCR 094 shows several violations of TSP standards, both in Kansas and in Missouri with the highest concentrations being indicated in Kansas (Table A-4). Particulate emissions are about evenly distributed between the two states (Table A-8), although a much smaller fraction of total emissions results from fuel combustion in Kansas than in Missouri. The original Kansas SIP gave no indication that particulate regulations would more than meet air quality standards in AQCR 094. Therefore, Metro Kansas City is rated as a bad candidate for fuel switching and regulation relaxation from a particulates standpoint.

SO_2 levels are slightly below ambient air quality standards in 094 (Metro Kansas City), with somewhat higher readings in Kansas than in Missouri (Table A-5).

As might be expected, most of the SO_2 results from fuel combustion in 094, especially in Missouri (Table A-7). The Missouri contribution to total SO_2 emissions is much higher than that of Kansas. AQCR 094 is assigned a 45000 ton regionwide tolerance for increased SO_2 emissions, based on a 22% rollup of air quality levels to standards. Table A-10 distributes this tolerance between Missouri and Kansas, in proportion to existing emissions. Table B-2 rates AQCR 094 as a good initial candidate for fuel switching and regulation relaxation relative to SO_2.

3.1.2 Emission Source Examination

The three large power plants in the Kansas portion of AQCR 094 all use some coal at present (Table C-1). SO_2 emissions from these plants are only about 30% of those allowed under existing regulations. Likewise, particulate emissions are well below existing regulations, reflecting the natural gas contribution to the fuel mix. Industrial sources listed in the NEDS data bank show no coal use by this sector at present. A comparison of existing and allowable emissions for industrial sources (Table D-1) reveals that considerably increased emissions of both SO_2 and particulates could occur under existing regulations.

A small amount of coal is currently used by area sources in AQCR 094, but large scale fuel switching is probably not practical for many of non-coal users (Table E-1). Further, existing regulations would exempt many of the smaller sources from controls (mainly due to size). A similar situation exists for other Kansas AQCR's and thus no further evaluation of area source fuel switching in Kansas will be pursued, since regulation changes would not be required to accomplish fuel switching. Table E-1 shows that 42% of total energy use in Kansas is by area sources.

3.1.3 Regulation Examination

The analysis in Table F-1 for AQCR 094 suggests that existing regulations on fuel burning sources alone could create more particulate emissions than would be required to meet the NAAQS. Of course, the emission tolerance from Table A-8 could be redistributed to allow more emissions in Kansas and less in Missouri, but very strict controls on non-fuel emissions would still be required if particulate standards are to be attained in AQCR 094. Therefore no particulate regulation relaxation is justified in 094.

Table F-2 for AQCR 094 shows that SO_2 emissions from fuel burning sources could more than double under the existing SO_2 regulations. This increase alone would exceed the Kansas "allowed emissions" in Tables A-9 and F-2. A large portion of the SO_2 emissions in AQCR 094 do originate in Missouri however, and controls in Missouri could allow additional emissions in Kansas. From a strictly "Kansas" standpoint, however, fuel SO_2 regulations in 094 may not be strict enough for major fuel changes, since:(1) no regulations on SO_2 emissions from non-fuel sources in Kansas are in effect (except smelters), and (2) total SO_2 emissions would be considerably more than allowable if all sources emitted at regulation levels and area source fuel conversions could occur without regulation change, increasing SO_2 (and particulate) emissions. It is therefore concluded than no room for SO_2 regulation relaxation exists in the Kansas portion of AQCR 094.

3.2 EASTERN KANSAS AQCR's 095 (NORTH EAST) AND 098 (SOUTH EAST)

3.2.1 Candidacy Assessment

Table A-4 shows the two eastern AQCR's to have violations of both annual and 24 hour particulate standards. Both AQCR's would require approximately 46% reduction of emissions in order to meet the 24 hour secondary standard. AQCR 095 (North East) is further from the annual standard (72%) than 098 (South East) with 19%. Reported emissions in Table B-1 are relatively high in these two AQCR's, although fuel combustion contributes only a small fraction of the total emissions. AQCR's 095 and 098 are rated as bad candidates for fuel switch potential and particulate regulation relaxation in Table B-1.

SO_2 levels in the two eastern AQCR's, and the rest of Kansas as well, are below standards at present. In Table B-2 therefore, all Kansas AQCR's (including AQCR 094) are rated as good candidates for fuel switch examination from an SO_2 standpoint. An emission tolerance (Table A-10) was not assigned, since it was felt that such a calculated rollup of emissions was unrealistic in Kansas.

3.2.2 Emission Source Examination

AQCR's 095 and 098 both have coal burning power plants (Table C-1). Particulate emissions from these plants are somewhat below regulations at present. SO_2 emissions are quite a bit below regulations in AQCR 098 because gas makes up the bulk of fuel used in power plants and in AQCR 095 because of both gas use and SO_2 controls at the Lawrence, Kansas, plant.

Industrial sources in 095 use no coal according to the NEDS data (Table D-1) and both SO_2 and particulate emissions are well below what regulations would allow. In 098, coal use by industrial sources causes particulate regulations to be exceeded (Table D-2). Fuel switching abilities of individual sources is not known for either AQCR 095 or 098, and therefore only a comparison of existing and allowed emissions is shown in Appendix D.

Area sources consume large quantities of coal in AQCR's 095 and 098 (Table E-1). Regulations do not apply to most small fuel users so that fuel conversions are probably limited by other considerations.

3.2.3 Regulation Evaluation

AQCR's 095 and 098 are dominated by non fuel particulate emissions (Table F-1). Some additional particulate emissions from fuel burning sources could occur under existing regulations in 095, while in 098 sources are very nearly emitting at average regulations. Large reductions from non-fuel emitters are required to reach "allowed emissions," regardless of fuel burning emissions. It is concluded that no room for particulate regulation relaxation exists in AQCR's 095 and 098.

Table F-2 evaluates current SO_2 emissions relative to the existing regulations. Since "allowable" emissions based on current air quality could not be realistically calculated for AQCR's 095 and 098, a "rollup" ratio was calculated instead. It can be seen that five times more SO_2 emissions in AQCR 095 and 1.6 times more emissions in 098 could occur under existing regulations.

To the extent that a regional approach is valid, AQCR 095 can probably not tolerate more SO_2 emissions than current regulations would already allow. Therefore, no SO_2 regulation relaxation is recommended in 095. AQCR 098 is more of an SO_2 fuel regulation relaxation prospect, depending on non-fuel SO_2 controls. 098 may be considered for SO_2 regulation relaxation, although vastly increased coal use could occur in power plants without regulation changes.

3.3 AQCR 099 (SOUTH CENTRAL)

3.3.1 Candidacy Assessment

Suspended particulate violations (Table A-4) of both annual and short term standards are widespread in AQCR 099. Although most of the emissions are non-fuel related, this AQCR is rated a bad candidate for particulate regulation relaxation for fuel switching purposes (Table B-1).

SO_2 levels are about 60% below standards at the 2nd highest station in AQCR 099 (the 2nd highest value at the highest station was not available), suggesting about 19000 tons allowable regionwide emissions in Table A-10. AQCR 099 is rated a good candidate for fuel switch investigation relative to SO_2.

3.2.2 Emission Source Evaluation

Power plants (Table C-1) use no coal at present in AQCR 099 and very little oil. The large natural gas use allows SO_2 and particulate emissions to be well below regulations (Table C-2). Industrial sources likewise use mostly gas and their emissions are low relative to SO_2 and particulate regulations.

3.3.3 Regulation Evaluation

Table F-1 shows that non-fuel sources dominate the particulate emissions total in 099, and that fuel particulate emissions could increase considerably without regulation changes. More over, particulate emissions from all fuel sources burning at regulations alone would exceed the regional requirement for air quality. Particulate regulations should not be relaxed in AQCR 099.

SO_2 regulations (Table F-2) applied to all fuel sources results in drastically increased regional emissions. The allowed 19000 tons estimated from air quality (Table A-10) is exceeded by a factor of five. It is recommended that SO_2 regulations not be relaxed in AQCR 099.

3.4 WESTERN AQCR's 096, 097, and 100

3.4.1 Candidacy Assessment

Particulate violations are generally of short term nature and are somewhat localized in AQCR's 096, 097, 100 (Table A-4). The percent of particulate emissions from fuel combustion is low in these AQCR's. In Table B-1, then, AQCR's 096, 097, and 100 are rated as marginal candidates for regulation examination and fuel switching.

SO_2 levels are very low in the western AQCR's and AQCR's 096, 097, and 100 are rated as good candidates for regulation examination (Table B-2). A quantitative estimate of allowed SO_2 emissions is not possible, however.

3.4.2 Emission Source Examination

Natural gas is the major fuel for both industry and power plants in western Kansas (Table C-1 and D-1). SO_2 and particulate emissions are therefore low relative to regulations (C-2 and D-2). No coal is known to be used by either category of fuel user.

3.4.3 Regulation Examination

Particulate emissions from fuel sources can substantially increase in western Kansas without regulation changes (Table F-1). Relaxation of regulations on fuel burners could be considered if non-fuel sources are more strictly controlled.

SO_2 emissions could increase more than 10 times in western Kansas without violation of existing regulations. Although regional SO_2 allowed emissions were not calculated (and might have little meaning in any case for such widely dispersed emissions), it would seem unlikely that local violations would not occur somewhere if SO_2 emissions increase by such a magnitude. It is recommended that SO_2 regulations not be relaxed in western Kansas.

3.5 SPECIAL CONSIDERATION - FOSSIL FUELS (TABLE F-3)

Kansas has large reserves of coal, oil and natural gas. Currently Kansas produces more of all three fuels than is consumed internally. It would seem that fuel switching would not be constrained by reserves or production from a purely Kansas viewpoint. Much of Kansas coal does tend to be high in sulfur, however.

APPENDIX A
BACKGROUND INFORMATION ON SIP, AIR QUALITY EMISSIONS

- State implementation plan information
- Current air quality information
- Current emissions information

Tables in this appendix summarize original and modified state implementation plan information. including original priority classifications, attainment dates, ambient air quality standards, and fuel combustion emission regulations. SAROAD data for SO_2 and TSP monitoring stations are shown for AQCRs in the state. NEDS emissions data by AQCR[1] are tabulated and broken down into fuel burning categories.

Tables A-9 and A-10 show a comparison of emission inventories in the original SIP and those from the NEDS. An emission tolerance, or emission tonnage which might be allowed in the AQCR and still not violate national secondary ambient air quality standards, is shown for SO_2 and particulates. The intent of this calculation is to indicate possible candidate regions for fuel switching. Tolerance was based on either the degree of control expected by the SIP or upon air quality/emission relationships which are calculated from more recent data. The value of the emission tolerance provides an indication of the degree of potential an AQCR possesses for fuel revisions and regulation relaxation.

Methodology for Increased Emissions Tolerance

A tolerance for increased emissions was determined as follows. First, an "allowable emissions" was calculated for each AQCR based on the current NEDS data and the percent reduction (or increase) required to meet the national secondary ambient air quality standards in that AQCR (worst case from Tables A-4 and A-5). This "allowable" was then compared to that from the SIP. If reasonable agreement occurred, then the "estimated emissions" which would result after implementation of the SIP in that AQCR was used to calculate an emissions tolerance. Thus, some credit could be given to an AQCR which might be restricting emissions more than required by ambient air quality standards. For instance, emission controls applied to AQCR's

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[1] "1972 National Emissions Report," EPA - 450/2-74-012, June 1974.

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other than the example region for the state may reduce emissions well below "allowables." In the event that no data existed or was available from the SIP for an AQCR, the current air quality was used to assign emissions tolerance based on proportional rollback or rollup. Current air quality was also the criteria, if emissions data from SIP and NEDS did not appear to be comparable (this is often the case).

When no SIP emissions data was available, and current air quality levels were less than one half of the level represented by an ambient air quality standard, no "rollup" emissions tolerance was calculated in Tables A-10 and A-10. This arbitrary cutoff point was chosen so as not to distort the emissions tolerance for an area. At low levels of a pollutant, the relationship between emissions and air quality is probably not well defined. Although this cutoff may leave some AQCR's with no quantifiable emissions tolerance, it was felt that no number at all would be preferable to a bad or misleading number.

It is emphasized that emissions tolerance is a region-wide calculation. This tolerance obviously makes more sense in, say, an urban AQCR with many closely spaced emissions sources than in a largely rural AQCR with geographically dispursed emissions.

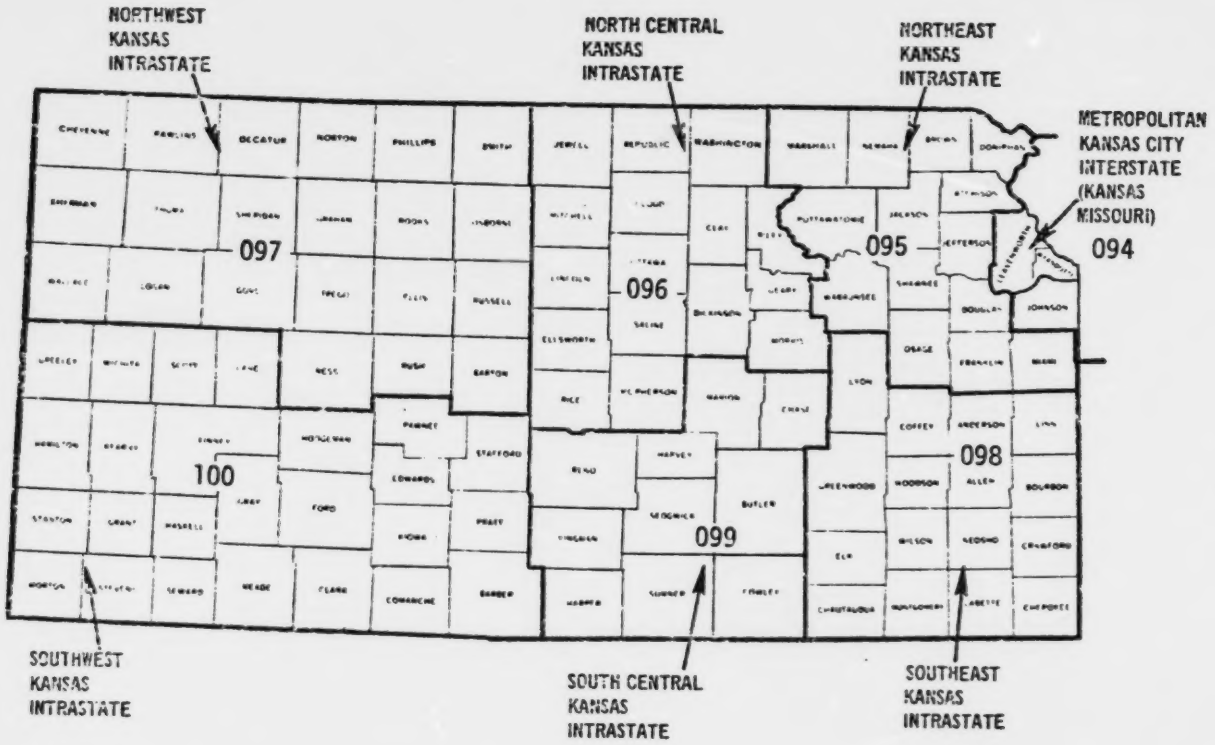

Figure A-1. Kansas AQCR's

Table A-1. Kansas AQCR Priority Classification and AQMAs

AQCR	Fed. #	Priorities			Demographic Information			AQMA Designations		
		Part.[a]	SO_x[b]	NO_x[c]	Population 1970	Square Miles	Population Density	TSP Counties	SO_x Counties	NO_x Counties
Metro Kansas City Interstate	094	I	III	III	Kansas 450,258	1094	411	None	-	-
					Missouri 953,923	3117	306	None		
Northeast	095	I	III	III	371,227	8656	43	None	-	-
North Central	096	I	III	III	267,137	11632	23	None	-	-
Northwest	097	I	III	III	162,642	19773	8	None	-	-
Southeast	098	III	III	III	263,679	10336	26	None	-	-
South Central	099	I	III	III	570,018	9955	57	None	-	-
Southwest	100	I	III	III	154,110	20378	7.6	None	-	-

Criteria Based on Maximum Measured (or Estimated) Pollution Concentration in Area

Priority	I	II	III
	Greater than	From - To	Less than
[a]Sulfur oxide:			
Annual arithmetic mean ..	100	60-100	60
24-hour maximum	455	260-455	260
[b]Particulate matter:			
Annual geometric mean ...	95	60- 95	60
24-hour maximum	325	150-325	150
[c]Nitrogen dioxide	110		110

[d]Federal Register, August, 1974 SMSA's showing potential for NAAWS violations due to growth

Table A-2. Kansas Attainment Dates

AQCR #	Name	Particulates Attainment Dates		Sulfur Dioxide Attainment Dates		Nitrogen Oxides Attainment Dates
		Primary	Secondary	Primary	Secondary	
094	Metro Kansas City Interstate	7/75	7/75	a	a	a
095	Northeast	7/75	7/75	a	a	a
096	North Central	7/75	7/75	a	a	a
097	Northwest	7/75	7/75	a	a	a
098	Southeast	a	a	a	a	a
099	South Central	7/75	7/75	a	a	a
100	Southwest	7/75	7/75	a	a	a

a) Already below standards.

Table A-3. Ambient Air Quality Standards - Kansas

(Expressed as $\mu g/m^3$)

		Total Suspended Particulate		Sulfur Oxides			Nitrogen Dioxide
		Annual	24 hr.	Annual	24 hr.	3 hr.	
Federal	Primary	75 (G)	260[a]	80 (A)	365[a]		100 (A)
	Secondary	60 (G)	150[a]			1300[a]	100 (A)
State		Same as Federal					

a) Not to be exceeded more than once per year.

A) = Annual arithmetic mean.

G) = Annual geometric mean.

Table A-4. Kansas, AQCR Air Quality Status (1973), TSP[5]

AQCR Name	AQCR #	# Stations Reporting	TSP Concentration (g/m^3) Highest Reading Annual	Highest Reading 24-Hr	2nd Highest Reading 24-Hr	# Stations Exceeding Ambient Air Quality Standards Primary Annual	Primary 24-Hr[6]	Secondary Annual	Secondary Annual %	Secondary 24-Hr[6]	Secondary 24-Hr %	% Reduction Required to Meet Annual Standards[8]	% Reduction to Meet 24 Hour Standard
Metro K.C. Interstate													
Kansas	094	14	128	479	442	6	4	7	50	9	64	85(1)	66(4)
Missouri		19	77(7)	440	254	1(7)	0	1(7)	-	12	63	-(7)	41
		33				7	4	8	-	21	63	85(1)	66(4)
Northeast	095	10	91	277	276	1	1	3	33	3	33	72(1)	46
North Central	096	6	70	682	501	0	1	1	17	1	17	33(2)	70
Northwest	097	5	66	345	294	0	1	1	20	2	40	33(1)	49
Southeast	098	6	67	382	279	0	1	1	17	4	67	19(3)	46
South Central	099	15	105	365	340	1	1	4	27	5	33	80(1)	56
Southwest	100	5	71	303	243	0	0	1	20	1	20	35(2)	38

(1) Background 48 ug/m^3
(2) Background 40 ug/m^3
(3) Background 30 ug/m^3
(4) No background assumed on 24 hour readings.
(5) In SAROAD data bank, June 1974.
(6) 2nd Highest 24 hour reading.
(7) Most stations in Missouri had insufficient data for computation of annual geometric mean.

$$\% \text{ Reduction} = \left(\frac{\text{current level - standard}}{\text{current level - background}} \right) \times 100$$

Table A-5. Kansas SO_2 Air Quality Status[1]

AQCR Name	AQCR #	# Stations Reporting 24-Hr (Bubbler)	# Stations Reporting (Contin.)	Highest Reading ($\mu g/m^3$) Annual	Highest Reading ($\mu g/m^3$) 24-Hr	2nd Highest Reading ($\mu g/m^3$) 24-Hr	# Stations Exceeding Ambient Air Quality Stds. Primary Annual	Primary 24-Hr	Secondary 3-Hr	% Reduction Required to Meet Annual Standards	% Required to Meet 24 Hour Standard
Metro K.C. Kansas	094	7	4	28	326	300	0	0	a	a	-22
Missouri		5	2	N/A	251	N/A					a
		12	6	28	320	300					-22
Northeast	095	10	1	20	249	77	0	0	-	a	a
North Central	096	3	1	9	64	43	0	0	--	a	a
Northwest	097	4	1	15	80	60	0	0	-	a	a
Southeast	098	3	-	9	63	56	0	0	-	a	a
South Central	099	3	3	27	290	228	0	0	-	a	-60
Southwest	100	2	-	13	68	68	0	0	-	a	a

[1]SAROAD data bank, June 1974.

[a]Already below standards.

Table A-6. Kansas Fuel Combustion Source Summary[a]

AQCR	AQCR #	Kansas Power Plants NEDS[b]	Kansas Power Plants FPC[c]	Other Fuel Combustion Point Sources[b] Particulate	Other Fuel Combustion Point Sources[b] SO_2
Metro K.C. Missouri	094	2 9	3 10	3 15	3 15
Northeast	095	3	2	6	6
North Central	096	5	2	4	3
Northwest	097	9	2	4	2
Southeast	098	6	3	10	6
South Central	099	9	5	14	8
Southwest	100	4	3	5	0

[a]Kansas sources only.

[b]NEDS data bank, June 1974.

[c]In EPA data bank, September 1974,

FPC stands for Federal Power Commission.

Table A-7. Kansas Emissions Summary, SO_2[a]

AQCR Name	AQCR #	Total 10^3 Tons/Year	Percent Fuel Combustion	Electricity Generation 10^3 Tons/Year	Electricity Generation %	Point Source Fuel Combustion 10^3 Tons/Year	Point Source Fuel Combustion %	Area Source Fuel Combustion 10^3 Tons/Year	Area Source Fuel Combustion %
Metro Kansas City	094								
Kansas		28.4	68	10.3	36	0.4	1.4	8.6	3.0
Missouri		176	94	156	89	9.1	5.1	1.0	0.6
Total		204	90	166	81	9.5	4.6	9.6	4.7
Northeast	095	14.4	89	10	69	.28	1.9	2.6	18
North Central	096	4.2	38	0.18	4.3	.03	0.71	1.4	33
Northwest	097	2.3	43	.06	2.6	.06	2.6	0.87	38
Southeast	098	32.9	25	3.8	11.6	.80	2.4	3.5	11
South Central	099	11.9	42	0.32	2.7	.52	4.4	4.1	35
Southwest	100	1.8	47	.03	1.7	0	0	0.82	47

[a]1972 National Emissions Report EPA - 450/2-74-012, June 1974.

Table A-8. Kansas Emissions Summary, Particulates[a]

AQCR Name	AQCR #	Total 10^3 Tons/Year	Percent Fuel Combustion	Electricity Generation 10^3 Tons/Year	Electricity Generation %	Point Source Fuel Combustion 10^3 Tons/Year	Point Source Fuel Combustion %	Area Source Fuel Combustion 10^3 Tons/Year	Area Source Fuel Combustion %
Metro Kansas City 094									
Kansas		42.2	15	0.625	1.5	.054	0.1	5.8	14
Missouri		35.7	55	16.86	47	1.78	5.0	1.1	3.0
Total		77.9	33.7	17.5	22	1.8	2.3	6.9	8.9
Northeast	095	44.3	7.8	2.2	5.0	.12	.3	1.1	2.5
North Central	096	23.4	4.0	.05	0.2	.18	.8	0.70	3.0
Northwest	097	13.4	5.1	.17	1.3	.04	.3	0.47	3.5
Southeast	098	184	2.8	3.3	1.8	0.70	.4	1.1	0.6
South Central	099	40.1	8.0	0.54	1.3	0.19	.5	2.5	6.2
Southwest	100	37.1	1.7	0.10	0.3	.03	.1	0.50	1.4

[a] 1972 National Emissions Report, EPA - 450/2-74-012, June 1974.

Table A-9. Kansas Required Emission Reductions - Particulates

AQCR	AQ Measurement Control Value ($\mu g/M^3$)	Emissions (10^3 tons)	Allowable Emissions (10^3 tons)	1975 Estimated Emissions After Controls (10^3 tons)	Percent Reduction Required Based On 1973 AQ Data	NEDS Emissions (10^3 tons)	Allowable Emissions (10^3 tons)	Emission Tolerance (10^3 tons)
	SIP				1973 Data			
094(KC) Total (KC+Mo.)	197(AGM)②	104	7.4 (1)	AQDM① used	85 Kansas Missouri	42.2 35.7 77.9	6.3 5.4 11.7	0③
095(NE)	150	N/A	-	-	72	44	12.2	0④
096(NC)	99	N/A	-	-	70	23	6.9	0④
097(NW)	124	N/A	-	-	49	13	6.6	0④
098(SE)	60	N/A	-	-	46	184	100	0④
099(SC)	184	N/A	-	-	80	40	8	0④
100(SW)	107	N/A	-	-	35	37	24	0④

①Particulate example region for Kansas was AQCR 094. Strategy development based upon AQDM. Allowable emissions in this table for 094 is based on proportional rollback with 48 $\mu g/m^3$ background.
②AGM = annual geometric mean.
③Current NEDS total emissions are less than SIP total emissions suggesting progress on controls. Calculated "allowable" emissions are comparable between NEDS and SIP. No information is available to suggest emissions will be less than "allowable" after plan is implemented so that zero tolerance is assigned to AQCR 094.
④Lack of SIP information dictates that all Kansas AQCRs be assigned zero tolerance for particulate emissions based on current air quality.

Table A-10. Kansas Required Emission Reductions - SO_2

AQCR	SIP: AQ Measurement Control Value (ug/M^3)	SIP: Emissions (10^3 tons)	SIP: Allowable Emissions (10^3 tons)	SIP: 1975 Estimated Emissions After Controls (10^3 tons)	1973 Data: Percent Reduction Required Based On 1973 AQ Data	1973 Data: NEDS Emissions (10^3 tons)	1973 Data: Allowable Emissions (10^3 tons)	Emission Tolerance (10^3 tons)
094(KC)	100 (24 Hr Max) 20 (AAM)[1]	119	435	[AQDM used]	-22	Kansas 28 Missouri 176 204	34 215 249	6 39 45[c]
095(NE)	19 (24 Hr Max)	-			0	14.4	a	b
096(NC)	-	-			0	4.2	a	b
097(NW)	-	-			0	2.3	a	b
098(SE)	-	-			0	329	a	b
099(SC)	17 (24 Hr Max)	-			-60	11.9	19.0	7.14
100(SW)	-	-			0	1.8	a	b

[1] AAM = annual arithmetic mean.

[a] Allowable emissions are not known for these AQCRs, since proportion "rollup" from current air quality results in unrealistically high emissions allowed.

[b] Increased emissions can be allowed in these AQCRs but exact amount cannot be quantified with data available for this report.

[c] This is a regionwide emission tolerance for increased emissions base on proportional rollup to air quality standard.

Allowed emissions are distributed to each state in the AQCR proportional to existing emissions.

Table A-11. Kansas Fuel Combustion Regulations
(Effective January 1, 1974)

	Existing Sources[1]		New Sources
	Heat Input 10^6BTU/hr(I)	Allowable Emissions(A) lb/10^6 BTU	
Particulates	10	0.60	Power Plants[2] 0.1 lbs/10^6 BTU
	10,000	0.12	Other sources same as existing Kansas regulations.
	$A = 1.026\ I^{-.233}$		
SO_2	3.0 lbs $SO_2/10^6$ BTU		0.8 lbs $SO_2/10^6$ BTU - oil[2] 1.2 lbs $SO_2/10^6$ BTU - coal
NO_x	Gas & Oil (> 250 x 10^6 BTU/hr)	0.3 lb $NO_2/10^6$ BTU	Power Plants[2] Gas = 0.2 lbs $NO_2/10^6$ BTU Oil = 0.3 lbs $NO_2/10^6$ BTU
	Coal (> 250 x 10^6 BTU/hr)	0.9 lb $NO_2/10^6$ BTU	Coal - 0.7 lbs $NO_2/10^6$ BTU

Having heat input greater than:

1 (A) Coal - 350 x 10^3 BTU/hour
(B) Heavy oil - 350 x 10^3 BTU/hour
(C) Light oil - 1 x 10^6 BTU/hour
(D) Gas - 100 x 10^6 BTU/hour

2 Federal new source performance standards, 36 Fed. Reg. 24876, Dec. 26, 1971.

APPENDIX B

CANDIDACY ASSESSMENTS FOR RELAXATION OF REGULATIONS/FUEL SWITCH POTENTIAL

Tables B-1 and B-2 are the assessment of AQCR's which should be examined for the fuel switching impact on particulate and SO_2 emissions. They also provide an identification of those AQCR's which show little potential for fuel revision or regulation relaxation if ambient air standards are to be attained.

Those AQCR's designated "good" or "marginal" here will be examined in later appendices where an attempt will be made to estimate the emissions resulting from an assumed fuel schedule different from the present, or the emissions which might result if all fuel burning sources emitted up to their "allowables."

The criteria for candidates are:(1) the severity and breadth of air quality violations, (2) the tolerance for emissions increased in the AQCR, (3) the fraction of total emissions resulting from fuel combustion, and (4) AQMA designations. It should be noted that an AQCR may not necessarily need relaxation of regulations in order to accomplish fuel switching. Further, a good candidate in Tables B-1 and B-2 may later show little potential for fuel switching after individual sources are examined. Finally it is posssible that an AQCR may have air quality levels below standard at present and may require more <u>strict</u> regulations than currently exist if all fuel burning sources were converted to dirtier fuels, i.e., "average" emission rate now may be below "average" regulations.

B-1 Candidacy Assessment for Relaxation of Particulate Regulations/Fuel Switch Potential

AQCR	Air Quality: # Monitors	Air Quality: # Monitors Showing Violations	Expected Attainment Date	Total Emissions (10^3 tons)	Any Counties AQMA Designations?	% Emission from Fuel Combustion	Tolerance for Emissions Increase (10^3 tons)	Overall Regional Evaluation
094								
Kansas	14	9	7/75	42	No	15	0	Poor Candidate
Missouri	19	12		36		55		
	33	21		78		34		
095(NE)	10	3	7/75	44	No	8	0	Poor Candidate
096(NC)	6	1	7/75	23	No	4	0	Marginal candidate
097(NW)	5	2	7/75	13	No	5	0	Marginal candidate
098(SE)	6	4	7/75	184	No	3	0	Poor Candidate
099(SC)	15	5	7/75	40	No	8	0	Poor Candidate
100(SW)	5	1	7/75	37	No	2	0	Marginal candidate

B-2. Candidacy Assessment for Relaxation of SO_2 Regulations

AQCR	Air Quality: # Monitors	Air Quality: # Monitors Showing Violations	Expected Attainment Date	Total Emissions (10^3 tons)	Any Counties AQMA Designations?	% Emission from Fuel Combustion	Tolerance for Emissions Increase (10^3 tons)	Overall Regional Evaluation
094								
Kansas	11	0	a	28	No	68	6	Good candidate
Missouri	7	0		176		94	39	
	18			204		90	45	
095(NE)	11	0	a	14.8	No	89	b	Good candidate
096(NC)	4	0	a	4.2	No	38	b	Good candidate
097(NW)	5	0	a	2.3	No	43	b	Good candidate
098(SE)	3	0	a	32.9	No	25	b	Good candidate
099(SC)	6	0	a	11.9	No	42	7.14	Good candidate
100	2	0	a	1.8	No	47	b	Good candidate

APPENDIX C
POWER PLANT ASSESSMENTS

This section is a review of individual power plants by AQCR. The intent is to illustrate: (1) current SO_2 and particulate emissions, (2) fuel switching possibilities, and (3) allowed emissions for power plants based on current regulations. The total AQCR emissions resulting from possible fuel switches is then calculated.

Current power plant information used to prepare Table C-1 were obtained from three main sources: (1) Federal Power Commission computerized listings of power plants and their associated fuel use, (2) the National Coal Association "Steam Tables" listing of power plants and fuel use in 1972, and (3) NEDS Emissions data.[1] For those plants listed by the FPC (1 above), the 1973 fuel schedule was assumed, otherwise, fuel use is for 1972. Heat inputs are those based on actual fuel values where known, and average values shown in Table C-3 were used where not known. SO_2 and particulates emissions are those associated with the fuel use shown. In the case of particulates, emissions were calculated using NEDS emissions factors applied to the listed fuel schedule (in both tonnage and $lbs/10^6$ Btu). When a plant was not listed in NEDS, AP 42 emission factors were used to estimate SO_2 and particulate emissions (see Table C-3).

Table(s) C-1 also lists allowable emissions calculated by applying current regulations to the given plant, taken from Table A-12. (Particulate limits are assumed to be based on the entire heat input of the plant. Actual rules may be different when applied to each of several boilers in a power plant or applied on the basis of design capacity rather than actual amount of fuel used.)

Total fuels, emissions, and allowables are summed for each AQCR at the bottom of Table(s) C-1, and are shown again in Tables C-2 for comparison after fuel switch. Plants are switched entirely to coal where possible, and to 2.0% sulfur oil if a plant cannot use coal. The fuel switch calculations are intended to show the magnitude of emissions increase accompanying a fuel switch without additional controls. The exact emissions would depend upon actual fuel mix, amount of sulfur in fuels, and degree of emissions controls accompanying a fuel switch.

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[1] NEDS Data Bank 1974

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It might be cautioned that AQCR total emissions calculated in the tables of Appendix C (and also Appendix D) may not agree exactly with total emissions represented in Appendix A (Tables A-7, A-8). This is a result of both differing fuel schedules in 1973 compared to previous years and the relative "completeness" of the NEDS data bank. Along the same line, AQCR totals may contain a "mix" of 1972 and 1973 fuel schedules (and resulting emissions). The intent of the listings is not great precision, but rather to show approximate status relative to regulations at present, and to show results of fuel switching where possible.

Table C-4 lists power plants under construction or consideration for the near to medium term future. No evaluation of these plants is attempted here since Federal new source performance standards would apply. It is not the purpose of this report to evaluate such standards. Inclusion of new plants is for background information which might have a bearing on other decisions about emission regulations in an AQCR.

Table C-1. Kansas Power Plant Characterization - AQCR 094

AQCR	Plant Name	Fuel Use: Type, % Sulfur, % Ash	Fuel Use: Annual Quantity (1)	Fuel Use: Heat Input (10^6Btu/hr)	Emissions: SO_2 Existing tons/yr	SO_2 Existing lbs/10^6Btu	SO_2 Allowable tons/yr	SO_2 Allowable lbs/10^6Btu	Particulates Existing tons/yr	Particulates Existing lbs/10^6Btu	Particulates Allowable tons/yr	Particulates Allowable lbs/10^6Btu
094	Kaw 151 MW	Coal 3.85 12.8A	72.1	199	5323	1.21	13230	3.0	347		926	0.21
		Gas	7092	808 1007					53 400	.09		
	Quindaro #2	Coal 3.6S 11.5A	13.8	37.5	965	0.62	4638	3.0	22 (3)		401	0.26
		Gas	2774	316 353					21 43	.03		
	Quindaro #3	Coal 2.0S 11.5A	187	487	7290	1.23	17780	3.0	300 (2)		1128	0.19
		Gas	7615	868 1355					57 357	.06		
094	TOTALS	Coal	273	724	13578		35648	3.0	800		2455	
		Gas	17481	1992 2716								

(1) Coal - 10^3 tons; Oil - 10^3 BBL; Gas - 10^6 ft^3

(2) 1970 controls for particulates applied to 1973 fuel schedule

(3) Same degree of control assumed as Guindaro #2

Table C-1. Kansas Power Plant Characterization - AQCR 095

AQCR	Plant Name	Fuel Use: Type, % Sulfur, % Ash	Fuel Use: Annual[1] Quantity	Fuel Use: Heat Input (10^6Btu/hr)	Emissions: SO_2 Existing tons/yr	Existing lbs/10^6Btu	Allowable tons/yr	Allowable lbs/10^6Btu	Particulates Existing tons/yr	Existing lbs/10^6Btu	Allowable tons/yr	Allowable lbs/10^6Btu
095	Lawrence 613 MW	Coal 3.9S 12.8A	172	477	2030①	0.99	45412	3.0	187		2271	0.15
		Oil 2.1S	287	192	290①				48			
		Gas	24415	2787					183			
				3456	2320				418	.03		
	Tecumseh 346 MW	Coal 3.9S 12.9A	142	397	10685	1.82	18304	3.0	2340		1159	0.19
		Oil 1.9S	70	47	424				12			
		Gas	8321	949					62			
				1393	11119				2414	.42		
	Municipal Power Plant (Brown Co.)	Oil 1.0S	5.2	3.5	17	0.05	10958	3.0	54	0.15	767	0.21
		Gas	7300	830								
				834					54			
095	TOTALS				13456		74674	3.0	2886		4197	
		Coal	314	874								
		Oil	363	242								
		Gas	40036	4556								
				5672								

① SO_2 control @85%

Table C-1. Kansas Power Plant Characterization - AQCR 096

AQCR	Plant Name	Fuel Use: Type, % Sulfur, % Ash	Fuel Use: Annual[1] Quantity	Fuel Use: Heat Input (10^6Btu/hr)	Emissions: SO_2 Existing tons/yr	SO_2 Existing lbs/10^6Btu	SO_2 Allowable tons/yr	SO_2 Allowable lbs/10^6Btu	Particulates Existing tons/yr	Particulates Existing lbs/10^6Btu	Particulates Allowable tons/yr	Particulates Allowable lbs/10^6Btu
096	Abiline 34 MW	Oil 1.9S	21	14	127	0.14	2746	3.0	4	.019	265	0.29
		Gas	1707	195/209	127				13/17			
	McPherson 1 26 MW	Oil	0	0	0	--	381	3.0	--	.02	60	0.47
		Gas	249	29/29	0				2/2			
	McPherson 2 32 MW	Oil 2.0S	8	5.4	53	.06	2786	3.0	1	.02	270	0.29
		Gas	1819	207/212	53				14/15			
	Clay Center 12.5 MW	Oil 2.0S	1	0.7	7	.03	736	3.0	0.17	.02	98	0.40
		Gas	485	55.3/56	7				4/4			
096	TOTALS	Oil	3Q	20	187		6649	3.0	38		693	
		Gas	4270	486								

Table C-1. Kansas Power Plant Characterization - AQCR 097

AQCR	Plant Name	Fuel Use: Type, % Sulfur, % Ash	Fuel Use: Annual Quantity	Fuel Use: Heat Input (10^6Btu/hr)	Emissions: SO_2 Existing tons/yr	Emissions: SO_2 Existing lbs/10^6Btu	Emissions: SO_2 Allowable tons/yr	Emissions: SO_2 Allowable lbs/10^6Btu	Emissions: Particulates Existing tons/yr	Emissions: Particulates Existing lbs/10^6Btu	Emissions: Particulates Allowable tons/yr	Emissions: Particulates Allowable lbs/10^6Btu
097	Mullergren 119 MW	Oil 1.4S	34	23	158	.05	10145	3.0	6	.02	750	0.22
		Gas	6571	749/772					49/55			
	Ross Bch 1 13 MW	Oil 2.0S	17	12	112	.07	4875	3.0	3	.02	422	0.26
		Gas	3146	359/371					24/27			
	Hays 19 MW	Oil	--	--	--		1892	3.0	--	.01	201	.32
		Gas	1259	144/144					9/9			
	Colby 12 MW	Oil 2.0S	7	5	46	.09	1616		1	.02	178	.33
		Gas	1034	118/123					8/9			
097	TOTALS	Oil	58	40	316		18530		100		1551	
		Gas	12010	1370								

Table C-1. Kansas Power Plant Characterization - AQCR 098

AQCR	Plant Name	Fuel Use: Type, % Sulfur, % Ash	Fuel Use: Annual[1] Quantity	Fuel Use: Heat Input (10^6Btu/hr)	Emissions: SO_2 Existing tons/yr	Emissions: SO_2 Existing lbs/10^6Btu	Emissions: SO_2 Allowable tons/yr	Emissions: SO_2 Allowable lbs/10^6Btu	Emissions: Particulates Existing tons/yr	Emissions: Particulates Existing lbs/10^6Btu	Emissions: Particulates Allowable tons/yr	Emissions: Particulates Allowable lbs/10^6Btu
098	Riverton 155 MW	Coal 3.8S 11.6A	39	112	2904	0.99	9672	3.0	1100		709	.22
		Oil 2.2S	39	26	282				6.6			
		Gas	5246	598 / 736	3186				39 / 1146	.36		
	Neosho 113 MW	Coal 2.6S 11.2A	1.0	2.6	50		7687	3.0	80		589	.23
		Oil 2S	104	70	703				17			
		Gas	4494	512 / 585	753				34 / 131	.05		
	Coffeville 40 MW	Oil 2.0S (est)	9	6	59	.31	2497	3.0	2	.02	250	.30
		Gas	1611	184 / 190	59				12 / 14			
	Chanute 19 MW	Oil 2.0S	6	4	40	.09	1330	3.0	1	.02	154	.35
		Gas	850	97 / 101	40				6 / 7			
	Iola 14MW	Oil	--	--	--		275	3.0	--	.01	46	.50
		Gas	180	21 / 21					1 / 1			
098	TOTALS				4038		21462		1299		1748	
		Coal	40	115								
		Oil	158	106								
		Gas	12381	1412								

AQCR	Plant Name	Fuel Use: Type / % Sulfur / % Ash	Fuel Use: Annual[1] Quantity	Fuel Use: Heat Input (10^6Btu/hr)	Emissions: SO_2 Existing tons/yr	SO_2 Existing lbs/10^6Btu	SO_2 Allowable tons/yr	SO_2 Allowable lbs/10^6Btu	Particulates Existing tons/yr	Particulates Existing lbs/10^6Btu	Particulates Allowable tons/yr	Particulates Allowable lbs/10^6Btu
099	Evans 539 MW	Oil 1.2S	4.6	3	17	.001	41000	3.0	1	.02	2190	.16
		Gas	27394	3123					205			
				3126	17				206			
	Gill 348 MW	Oil 1.1S	97	65	350	.20	23192	3.0	16	.02	1391	.18
		Gas	14913	1700					117			
				1765	350				133			
	Ripley 87 MW	Oil 2.0 (est)	5.0	3.4	33	.08	5742	3.0	8	.02	479	.25
		Gas	3807	434					28			
				437					36			
	Hutchinson 257 MW	Oil 1.7S	91	61	499	.06	24992	3.0	15	.02	1500	.18
		Gas	16149	1841					121			
				1902					136			
	Winfield 45 MW	Gas	1117	127	--	--	1670	3.0	8	.01	.83	.33
									8			
	Wellington 14 MW	Oil	0	0	--	--	1143	3.0	--	.01	137	.36
		Gas	760	87	--	--			6			
				87					6			
099	TOTALS				899		97739		515		5880	
		Oil	198	132								
		Gas	64140	7312								

Table C-1. Kansas Power Plant Characterization - AQCR 100

AQCR	Plant Name	Fuel Use: Type, % Sulfur, % Ash	Fuel Use: Annual[1] Quantity	Fuel Use: Heat Input (10^6Btu/hr)	Emissions: SO_2 Existing tons/yr	Emissions: SO_2 Existing lbs/10^6Btu	Emissions: SO_2 Allowable tons/yr	Emissions: SO_2 Allowable lbs/10^6Btu	Emissions: Particulates Existing tons/yr	Emissions: Particulates Existing lbs/10^6Btu	Emissions: Particulates Allowable tons/yr	Emissions: Particulates Allowable lbs/10^6Btu
100	Cimarron 50 MW	Gas	3485	397	--	--	5217	3.0	26/26	.01	415	.25
	Judson Large 180 MW	Oil 0.77S	130	87	326	.09	11011	3.0	21	.02	771	.21
		Gas	6591	751/838	--				49/70			
	Garden City 27 MW	Oil 2.0	--	--	--	--	1695	3.0	--	.01	186	.33
		Gas	1135	129/129					8/8			
	Pratt 28 MW	Oil 2.0S	1	0.7	7	.02	933	3.0	--	.02	118	.38
		Gas	614	70/71	--				5/5			
	Larned 13 MW	Oil 2.0S	0.5	0.3	3	.01	723	3.0	.08	.02	96	.40
		Gas	480	55/55	--				4/4			
100	TOTALS	Oil	131	88	336		19579		113		1586	
		Gas	12305	1402								

C-2 Kansas , AQCR 094 Fuel Switch Evaluation (Power Plants)

Fuel	Present Use Quantity (1)	10^9 BTU/Y	Gas & Oil} to coal Quantity	10^9 BTU/Y	Gas to oil (2.0% S) only Quantity	10^9 BTU/Y
Coal	273	6340	1026	23820		
Oil	0	0	0	0		
Gas	17481	17481	0	0		
		23821		23820		

Emissions	Tons/y	Lbs/10^6 Btu	Tons/y	Lbs/10^6 Btu		Allowable Emissions Under Existing Regulations Tons/y	Lbs/10^6 Btu
SO_2	13578	1.14	56680	4.76		35648	3.0
Particulates	800	.067	2892	0.24		2455	0.21

(1) Coal - 10^3 tons
Oil - 10^3 BBl
Gas - 10^6 ft^3

C-2 Kansas , AQCR 095 Fuel Switch Evaluation (Power Plants)

Fuel	Present Use Quantity	10^9 BTU/y	Gas & Oil} to coal Quantity	10^9 BTU/y	Gas to oil only Quantity	10^9 BTU/y
Coal	314	7660	1830	42500		
Oil	364	2120	1250	7500		
Gas	40035	40036	0	0		
		49816		49816		

Emissions	Tons/y	lbs/10^6 Btu	Tons/y	lbs/10^6 Btu	Allowable Emissions Under Existing Regulations Tons/y	lbs/10^6 Btu
SO_2	13456	0.54	61270	2.46	74674	3.0
Particulates	2886	0.12	9790	0.39	4197	0.17

C-2 Kansas , AQCR 096 Fuel Switch Evaluation (Power Plants)

Fuel	Present Use Quantity	10^9 BTU/Y	Gas & Oil} to coal Quantity	10^9 BTU/Y	Gas to oil only Quahtity	10^9 BTU/Y	
Coal	0	0	0	0	0	0	
Oil	30	175	-	-	762	4445	
Gas	4270	4270	-	-	0	0	
		4445		4445		4445	
Emissions	Tons/y	Lbs/10^6 Btu			Tons/y	Lbs/10^6 Btu	Allowable Emissions Under Existing Regulations Tons/y Lbs/10^6 Btu
SO_2	187	.084			4978	2.2	6650 3.0
Particulates	38	.017			129	.058	693 0.31

C-2 Kansas , AQCR 097 Fuel Switch Evaluation (Power Plants)

Fuel	Present Use Quantity	10^9 BTU/Y	Gas & Oil} to coal Quantity	10^9 BTU/Y	Gas to oil (2.0% S) only Quantity	10^9 BTU/Y	
Coal	0	0	0	0	0	0	
Oil	58	338	-		2120	12350	
Gas	12010	12010	-		0	0	
		12350				12350	
Emissions	Tons/y	Lbs/10^6 Btu			Tons/y	Lbs/10^6 Btu	Allowable Emissions Under Existing Regulations Tons/y / Lbs/10^6 Btu
SO_2	316	.05	-		14019	2.3	18530 / 3.0
Particulates	100	.016	-		363	.06	1551 / 0.24

C-2 Kansas , AQCR 098 Fuel Switch Evaluation (Power Plants)

Fuel	Present Use Quantity	Present Use 10^9 BTU/Y	Gas & Oil} to coal Quantity	Gas & Oil} to coal 10^9 BTU/Y	Gas to oil only Quantity	Gas to oil only 10^9 BTU/Y
Coal	40	1008	500	11589	-	-
Oil	158	928	15	88		
Gas	12381	12381	2640	2640		
		14317		14317		

Emissions	Tons/y	Lbs/10^6 Btu	Tons/y	Lbs/10^6 Btu		Allowable Emissions Under Existing Regulations Tons/y	Lbs/10^6 Btu
SO_2	4038	0.56	30,450	4.25	-	21462	3.0
Particulates	1298	.18	25,000	3.5	-	1748	.24

C-2 Kansas , AQCR 099 Fuel Switch Evaluation (Power Plants)

Fuel	Present Use Quantity	10^9 BTU/y	Gas & Oil} to coal Quantity	10^9 BTU/y	Gas to oil only Quantity	10^9 BTU/y	
Coal	0	0	-		0	0	
Oil	198	1156	-		11184	65294	
Gas	644140	64140	-		0	0	
		65294				65294	
Emissions	Tons/y	Lbs/10^6 Btu			Tons/y	Lbs/10^6 Btu	Allowable Emissions Under Existing Regulations Tons/y / Lbs/10^6Btu
SO_2	899	.027			73,770	2.3	97,740 / 3.0
Particulates	515	.016			1,910	.058	5,880 / .18

C-2 Kansas , AQCR 100 Fuel Switch Evaluation (Power Plants)

Fuel	Present Use Quantity	10^9 BTU/Y	Gas & Oil} to coal Quantity	10^9 BTU/Y	Gas to oil only Quantity	10^9 BTU/Y	
Coal	0	0	-	-	0	0	
Oil	131	771			2222	13076	
Gas	12305	12305			0	0	
		13076				13076	

Emissions	Tons/y	Lbs/10^6 Btu		Tons/y	lbs/10^6 Btu	Allowable Emissions Under Existing Regulations Tons/y	Lbs/10^6 Btu
SO_2	336	.05	-	15,070	2.30	19,600	3.0
Particulates	113	.017	-	390	.06	1,586	.23

Table C-3. AP-42 Power Generation Emission Factors

Fuel	Particulates		SO_2		Hydrocarbons		NO_x (as NO_2)	
	Lbs/Ton	Lbs/10^6 Btu	Lbs/Ton	Lbs/10^6 Btu	Lbs/Ton	Lbs/10^6 Btu	lbs/Ton	Lbs/10^6 Btu
Coal(1) (Bit.)								
General	160	7.4			0.3	0.013	18	0.78
Wetbottom 10% A	130	7.0					30	1.3
Cyclone	20	0.9					55	2.4
1% S	Same	Same	38	1.65	0.3	0.013	Same	Same
2% S	as	as	76	3.3			as	as
3% S	Above	Above	114	5.0			Above	Above
Oil(2)	Lb/10^3 Gal		Lb/10^3 Gal		Lb/10^3 Gal		Lb/10^3 Gal	
0.5% S	8	0.058	79	0.56	2	.014	105	0.75
1.0% S	8	.058	157	1.12	2	.014	105	0.75
2.0% S	8	.058	314	2.24	2	.014	105	0.75
Gas(3)	Lb/10^6Ft^3		Lb/10^6Ft^3		Lb/10^6Ft^3		Lb/10^6Ft^3	
(.3 lbs S/ 10^6 Ft^3)	15	.015	0.57	.00057	1	.001	600	0.60

(1) Coal 23 x 10^6 Btu/Ton
(2) Oil 140 x 10^3 Btu/Gal
(3) Gas 1000 Btu/Ft^3

Table C-4. Kansas New and Proposed Power Plant[2]

AQCR	Plant Name	Fuel Use: Type, % Sulfur, % Ash	Fuel Use: Annual[1] Quantity	Fuel Use: Heat Input (10^6Btu/hr)	Emissions: SO_2 Existing tons/yr	Emissions: SO_2 Existing lbs/10^6Btu	Emissions: SO_2 Allowable tons/yr	Emissions: SO_2 Allowable lbs/10^6Btu	Emissions: Particulates Existing tons/yr	Emissions: Particulates Existing lbs/10^6Btu	Emissions: Particulates Allowable tons/yr	Emissions: Particulates Allowable lbs/10^6Btu
098	Lacygne #1 840 MW (1973) sched	Coal 4.1 19.7A	2200①	6027	1710①		31680	1.2	2820		2640①	0.1
	#2 630 MW (1977) sched	Coal	1700① / 3910		NA		NA		NA		NA	
095	Kansas Power & Light (Topeka) 700 MW (1978) sched	Coal	2350①		NA			1.2	NA			0.1

① Approximate coal usage at start up, "Assessment of the Impact of Air Quality Requirements on Coal in 1975, 1977, 1980," U.S. Bureau of Mines, January 1974. Emissions are from NEDS.

② EPA data bank listings, Sept. 1974

APPENDIX D
INDUSTRIAL COMMERCIAL SOURCES ASSESSMENT

The Tables D-1 in this appendix list individual industrial/commercial/institutional sources of particulates and SO_2 emissions which might show fuel switching potential. The sources are from a NEDS rank order emissions listing. Tables D-1 account for at least 95% of a total emissions (both fuel and non-fuel sources) in the AQCR, since not all industrial sources could be listed in this report. It should be cautioned that the percent emissions accounted for is different than the "% of fuel use accounted for." It is possible that several potential fuel switch sources could be overlooked by the cutoff point on the emissions (i.e., a reasonable sized natural gas used may emit below our cutoff point in the NEDS rank order list).

Fuel switch emissions calculations were not made for industrial sources, since no information was available for feasibility of <u>any</u> fuel switching. Current fuels and emissions are listed along with the emissions which would be allowed by existing regulations.

Table D-1. Industrial-Commercial Fuel Combustion Point Source Characterization Kansas

AQCR	Plant Name	Fuel Use: Type, % Sulfur, % Ash	Fuel Use: Annual (1) Quantity	Fuel Use: Heat Input (10^6 Btu/hr)	Emissions: SO_2 Existing tons/yr	SO_2 Existing lbs/10^6 Btu	SO_2 Allowable tons/yr	SO_2 Allowable lbs/10^6 Btu	Particulates Existing tons/yr	Particulates Existing lbs/10^6 Btu	Particulates Allowable tons/yr	Particulates Allowable lbs/10^6 Btu
094	GM Assembly	Oil(2)										
		-	9174	147								
		Gas(2)	840	95.9								
	Direct Fuel Combustion	Oil										
		1.8% S	225	3.6	32	0.08	907	3.0	3	0.02	114	0.38
		Gas	576	65.8	-				5			
				69	32				8			
094	Delco-Remy	Oil*										
		2.4%	585	9.3	111	0.28	1189	3.0	6	0.03	138	0.36
		Gas	705	80.5	-	-			6			
				88	111				12			
094	"0001" in county ≈ 2000	Oil										
		1.5% S	2560	40.9	241	0.89	812	3.0	29	0.11	138	0.51
		Gas	183	20.9	-				2			
				61.8	241				31			
Totals		Oil	3370	53.9	384		3201		51		390	
		Gas	1464	167								

(1) Coal - tons
Oil - 10^3 gallons
Gas - 10^6 ft^3

(2) Inprocess fuel use

Table D-1. Industrial-Commercial Fuel Combustion Point Source Characterization Kansas

AQCR	Plant Name	Fuel Use			Emissions							
					SO_2				Particulates			
					Existing		Allowable		Existing		Allowable	
		Type % Sulfur % Ash	Annual Quantity	Heat Input (10^6 Btu/hr)	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu
095	Atchison, Topeka, Santa Fe	Oil 0.5% S	560	8.9	22	0.05	1390	3.0	6	0.03	163	0.35
		Gas	858	97.9	-				8			
				106					14			
095	Mode C. Day	Gas	3500	400	1	<.01	5256	3.0	32	0.02	438	0.25
095	Co-op Farm Chemical	Gas	1600	183	132	0.16	2405	3.0	18	0.02	240	0.30
095	Midwest Solvents	Gas(2)	315	36.0	-			3.0	114			
		Oil 1.65%S	735	11.7	65	0.06	3090		9	0.13	298	0.29
		Gas	1638	187	-				15			
				235	65				138			
Totals	Oil		1295	20.7	220		12140		202		1139	
	Gas		7596	867								

(2) Inprocess Fuel Use

Table D-1. Industrial-Commercial Fuel Combustion Point Source Characterization Kansas

AQCR	Plant Name	Fuel Use			Emissions							
					SO_2				Particulates			
					Existing		Allowable		Existing		Allowable	
		Type % Sulfur % Ash	Annual Quantity	Heat Input (10^6 Btu/hr)	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu
096	"0002"	Gas	5250	599	2	<.01	7870	3.0	47	0.02	603	0.23
096	Supersweet Feeds	Gas	5080	580	2	<.01	7620	3.0	46	0.02	584	0.23
096	Northern Gas Products	Gas	9793	1118	0	-	14690	3.0	70	0.01	979	0.20
Totals	Gas		20123	2297	4		30180		163		2166	

Table D-1. Industrial-Commercial Fuel Combustion Point Source Characterization - Kansas

AQCR	Plant Name	Fuel Use			Emissions							
					SO_2				Particulates			
					Existing		Allowable		Existing		Allowable	
		Type % Sulfur % Ash	Annual Quantity	Heat Input (10^6 Btu/hr)	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu
097	Sherman Co.	Oil 1.0%S	345	5.5	27	0.05	1498	3.0	3	0.02	170	0.34
		Gas	948	108	-				9			
				114					12			
097	CRA	Gas	1400	160	-	-	2100	3.0	11	0.02	217	0.31
097	Centr. Tel. and Utilities	Oil 0.18%	4	0.06	-		3480	3.0	<1	-	324	0.28
		Gas	2320	265	-				17	0.01		
				265								
Totals	Oil		349	5.8	27		7080		35		712	
	Gas		4668	533								

Table D-1. Industrial-Commercial Fuel Combustion Point Source Characterization Kansas

AQCR	Plant Name	Fuel Use			Emissions							
					SO_2				Particulates			
					Existing		Allowable		Existing		Allowable	
		Type % Sulfur % Ash	Annual Quantity	Heat Input (10^6 Btu/hr)	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu
098	Gulf Oil Chem.	Coal 3.5%S 12.0%A	4560	12.0	303	0.59	1541	3.0	465	0.92	175	0.34
		Gas	931	106	-				8			
				118					473			
098	Gulf Oil Corp.	Coal 3.1%S 11.2%A	2000	5.3	118	0.24	1471	3.0	146	0.31	168	0.34
		Gas	938	107	-				8			
				112					154			
098	Kansas Army Ammo. Plant	Coal 3.27%S 9.0%A	1980	5.2	123	3.5	300	3.0	23	0.57	49	0.49
		Oil 2.0%S	1112	17.8	227				34			
				23.0	350				57			
Totals	Coal		8540	22.4	771		3312		684		392	
	Oil		1112	17.8								
	Gas		1869	213								

Table D-1. Industrial-Commercial Fuel Combustion Point Source Characterization **Kansas**

AQCR	Plant Name	Fuel Use			Emissions							
					SO_2				Particulates			
					Existing		Allowable		Existing		Allowable	
		Type % Sulfur % Ash	Annual Quantity	Heat Input (10^6 Btu/hr)	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu
099	Sedgwick Co.	Oil 2.0%S Gas	1102 833	17.6 95.1 112.7	125 -	0.25	1500	3.0	10 3 13	0.03	168	0.34
099	Sedgwick Co.	Oil 1.%S Gas	4644 507	74.2 57.9 132.1	181 -	0.31	1752	3.0	40 4 44	0.08	190	0.33
099	Skelly Oil	Oil 0.70%S Gas	3390 2690	54.2 307 361.2	168 -	0.11	4582	3.0	25 24 49	0.03	411	0.26
Totals		Oil	9136	146	474		7834		106		769	
		Gas	4030	460								

Table D-1. Industrial-Commercial Fuel Combustion Point Source Characterization - Kansas

AQCR	Plant Name	Fuel Use			Emissions							
					SO_2				Particulates			
					Existing		Allowable		Existing		Allowable	
		Type % Sulfur % Ash	Annual[1] Quantity	Heat Input (10^6 Btu/hr)	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu	tons/yr	lbs/10^6 Btu
100	Farmland Ind. Inc.	Gas	990	113	-	-	1484	3.0	9	0.02	168	0.34
100	Colomeian Carbon	Gas	900	103	-	-	1353		8	0.02	157	0.35
100	Cent. Telephone and Utilities	Oil 1.0%S	319	5.1	25	0.01	9408		1	0.02	699	0.22
		Gas	6230	711	2				47			
				716								
Totals		Oil	319	5.1	27		12245		65		1016	
		Gas	8120	927								

[1] Coal - tons
Oil - 10^3 gallons
Gas - 10^6 ft^3

Table D-2. Major Industrial Fuel and Emissions Summary for Kansas

AQCR	Fuel Acounted For			SO_2		Particulates	
	Coal Tons	10^3 Gal. Oil	10^6 ft^3 Gas	Existing Emissions (Tons)	Allowed Emissions (Tons)	Existing (Tons)	Allowed (Tons)
094	0	3370	1464	384	3200	51	390
095	0	1295	7596	220	12140	202	1140
096	0	0	20123	4	30000	163	2166
097	0	349	4668	27	7080	35	712
098	8540	1112	1869	771	3312	684	392
099	0	9136	4030	474	8834	106	769
100	0	319	8120	27	12245	65	1016
State Totals*	8540	15587	47870				

*Only major emission sources are accounted for in totals.

APPENDIX E
AREA SOURCE ASSESSMENT

Table E-1 shows area source fuel use for the State of Kansas by AQCR. The approximate energy values are compared for each fuel along with the percent of overall energy derived from each fuel. Data are those in NEDS as of November 1, 1974. State area source totals are calculated and the percent of energy derived from each fuel shown.

Area source fuel use is then compared to total fuel use in Kansas. The bottom row entitled "all fuels, all sources" may not match totals from Appendices A, C, and D exactly, since neither the NEDS or individual appendix totals are all-inclusive.

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Table E-1. Area Source Fuel Use —— Kansas

	Coal		Oil		Gas		Total
AQCR	Tons	10^9 Btu	10^3 bbl	10^9 Btu	10^3 ft^3	10^9 Btu	10^{12} Btu
094 (Kan + Missouri)	76750	1765	737	4334	109290	109290	115.4
095	20680	476	421	2475	46730	46730	49.7
096	11430	263	239	1405	39970	39970	41.6
097	7270	167	155	911	28720	28720	29.8
098	34060	783	245	1441	39100	39100	41.3
099	22500	518	666	3920	93620	93630	98.1
100	5450	140	206	1210	29370	29370	30.7
Area Source Total	178140	4112	2669	15696	386810	386810	407
Percent		(1.0%)		(3.9%)		(95.0%)	100%
State Total (all fuels, all sources)							996 x 10^{12} Btu

1) NEDS data bank, Nov. 1, 1974.

Notes: 42% of fuel use in Kansas is by area sources.

APPENDIX F

REGULATION EVALUATION AND FUEL STATISTICS

The Tables F-1 and F-2 illustrate the effect on emissions of particulates and SO_2 when power plant and industrial fuel burning sources listed in Appendices C and D are allowed to emit up to the amounts that existing regulations would allow. It is assumed that heat input remains the same, and existing regulations are applied to gross heat input for each power plant and industrial source. The column in Table F-1 labeled "Allowable Total Emissions" is the tonnage from Tables A-9 and A-10 which the region can tolerate while still not violating ambient air quality standards. In Table F-2 (SO_2 Evaluation) the analogous column indicates the ratio of emissions resulting when all sources are emitting at regulations to emissions at present.

Area fuel burning sources are assumed to remain unchanged, since SO_2 and particulate regulations generally do not apply to these sources. Non-fuel emission estimates from Tables A-7 and A-8 are included in the balance. Since the degree of control which will be achieved on non-fuel particulate sources was not known for this report, the particulate totals serve mainly to show magnitudes relative to tonnage allowed by air quality considerations. For SO_2 the non-fuel estimate would, in many AQCR's, remain about the same due to lack of other SO_2 regulations (except oil smelters). Thus, the SO_2 "roll up ratio" is not too far from that which would be possible under existing regulations.

A regional approach is implicitly assumed to have some validity in this exercise, so that any conclusions from the numbers in Tables F-1 and F-2 will have to be temperated for AQCR's with widely dispersed emissions.

Lastly, it is emphasized that these tables are hypothetical in that no fuel mix may exist to allow all sources to emit exactly at regulation levels. The calculations do give some insight into adequacy of existing regulations for allowing air quality standards to be achieved if a fuel schedule different from the one at present were in effect.

A Table F-3 is included in this appendix to summarize gross consumption and production of fossil fuels in Kansas.

Table F-1. Particulate Regulation Evaluation - Kansas

AQCR	10^{12} Btu	Current Emissions Tons/yr	Regulations lbs/10^6 Btu	Emissions with All Sources Emitting at Reg's	Estimate Allowable Emissions in AQCR tons/yr
094 (Kansas only)					
Power Plants	23.8	800	~0.2	2455	
Industry	1.95	51	.2 - .5	390	
Area Sources	44.2	5800		5800	
		6651		8645	
Non-Fuel	0	35900		35900	
Total	141.15	42,551		44,545	6300
095					
Power Plants	49.8	2886	~0.2	4200	
Industry	7.78	202	.2 - .5	1140	
Area Sources	49.7	1100		1100	
		4188		6440	
Non-Fuel	0	40800		40800	
Total	107.28	44,988		47,240	12,200
096					
Power Plants	4.45	38	~0.3	693	
Industry	20.1	163	.2 - .5	2166	
Area Sources	41.7	700		700	
		901		3559	
Non-Fuel	0	22500		22500	
Total	66.25	23,401		26,059	6,900

Table F-1. Particulate Regulation Evaluation - Kansas (Continued)

AQCR	10^{12} Btu	Current Emissions Tons/yr	Regulations lbs/10^6 Btu	Emissions with All Sources Emitting at Reg's	Estimate Allowable Emissions in AQCR tons/yr
097					
Power Plants	12.3	100	.24	1550	
Industry	4.7	35	.2 - .5	712	
Area Sources	29.8	470		470	
		605		2732	
Non-Fuel	0	12700		12700	
Total	46.8	13,305		15,432	6,600
098					
Power Plants	14.3	1300	~.24	1750	
Industry	2.22	684	.2 - .5	392	
Area Sources	41.3	1100		1100	
		3084		2242	
Non-Fuel	0	179,000		179,000	
Total	57.8	182,084		182,242	100,000
099					
Power Plants	65.3	515	.2	5880	
Industry	5.35	106	.2 - .5	769	
Area Sources	98.1	2500		2500	
		3121		9149	
Non-Fuel	0	36,900		36,900	
Total	168.75	40,021		46,049	8,000

Table F-1. Particulate Regulation Evaluation - **Kansas (Continued)**

AQCR	10^{12} Btu	Current Emissions Tons/yr	Regulations lbs/10^6 Btu	Emissions with All Sources Emitting at Reg's	Estimate Allowable Emissions in AQCR tons/yr
100					
Power Plants	13.1	113	.23	1590	
Industry	8.17	65	.2 - .5	1016	
Area Sources	30.7	500		500	
		678		3106	
Non-Fuel	0	36,500		36,500	
Total	51.97	37,178		39,606	24,000
Power Plants					
Industry					
Area Sources					
Non-Fuel					
Total					
Power Plants					
Industry					
Area Sources					
Non-Fuel					
Total					

Table F-2. SO_2 Regulation Evaluation - Kansas

AQCR	10^{12} Btu	Current Emissions tons/year	Reg's lbs/10^6 Btu	Emissions with All Sources Emitting at Reg's	Estimated Allowable Emissions for AQCR	Ratio of Emissions at Regulations to Current Emissions
094 (Kansas Only)					Kansas Only	
Power Plants	23.8	13578	3.0	35648		
Industry	1.95	384		3200		
Area Sources	44.24	8600		8600		
		22562		47448		
Non-Fuel	0	9090		9090		
Total	141.15	31,652		56,538	34,000	+ 1.78
095						
Power Plants	49.8	13456	3.0	74674		
Industry	7.78	220		12140	N/A	
Area Sources	49.7	2600		2600		
		16276		89414		
Non-Fuel	0	1580		1580		
Total	107.28	17,856		90,994		+ 5.10
096						
Power Plants	4.45	187	3.0	6650		
Industry	20.1	4		30000	N/A	
Area Sources	41.7	1400		1400		
		1591		38050		
Non-Fuel	0	2600		2600		
Total	66.25	4,191		40,650		+ 9.7

Table F-2. SO_2 Regulation Evaluation - Kansas (Continued)

AQCR	10^{12} Btu	Current Emissions tons/year	Reg's lbs/10^6 Btu	Emissions with All Sources Emitting at Reg's	Estimated Allowable Emissions for AQCR	Ratio of Emissions at Regulations to Current Emissions
097						
Power Plants	1223	316	3.0	18530		
Industry	4.7	27		7080	N/A	
Area Sources	29.8	870		870		
		1213		26480		
Non-Fuel	0	1310		1310		
Total	46.8	2523		27790		+ 11.0
098						
Power Plants	14.3	4038	3.0	21462		
Industry	2.22	771		3312	N/A	
Area Sources	41.3	3500		3500		
		8309		28274		
Non-Fuel	0	24675		24675		
Total	57.82	32,984		52,949		+ 1.6
099						
Power Plants	65.3	899	3.0	97740		
Industry	5.35	474		7834		
Area Sources	98.1	4100		4100		
		5473		109674		
Non-Fuel	0	6900		6900		
Total	168.75	12,373		116,574	19,000	+ 9.4

Table F-2. SO_2 Regulation Evaluation - Kansas (Continued)

AQCR	10^{12} Btu	Current Emissions tons/year	Reg's lbs/10^6 Btu	Emissions with All Sources Emitting at Reg's	Estimated Allowable Emissions for AQCR	Ratio of Emissions at Regulations to Current Emissions
100						
Power Plants	13.1	336	3.0	19600		
Industry	8.17	27		12245	N/A	
Area Sources	30.7	820		820		
		1183		32665		
Non-Fuel	0	950		950		
Total	51.97	2,133		33,615		+ 15.8
Power Plants						
Industry						
Area Sources						
Non-Fuel						
Total						
Power Plants						
Industry						
Area Sources						
Non-Fuel						
Total						

Table F-3. Kansas Fossil Fuel Summary*(1972)

	Production	Consumption
Coal 10^3 tons	1227	495
Oil 10^6 bbl	104	56
Gas 10^9 ft^3	889	633

*All oil and gas values are from "Fuel and Energy Data: U.S. by States and Regions," 1972 (U. S. Bureau of Mines). Coal consumption figure obtained from "Assessment of Impact of Air Quality Requirements on Coal in 1975, 1977, and 1980," (U. S. Bureau of Mines).

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